U. S. DEPARTMENT OF COMMERCE
Lewis L. Strauss, Secretary
WEATHER BUREAU
F. W. Reichelderfer, Chief

KEY TO METEOROLOGICAL RECORDS DOCUMENTATION NO. 4.1

HISTORY OF CLIMATOLOGICAL PUBLICATIONS

A HISTORY OF PUBLICATIONS CONTAINING CLIMATOLOGICAL DATA
ISSUED BY THE U. S. WEATHER BUREAU

WASHINGTON, D. C. : 1958

For sale by the Superintendent of Documents, U. S. Government Printing Office
Washington 25, D. C. - Price 20 cents

PURPOSE

The Key to Meteorological Records Documentation Series has been established to provide guidance information to research personnel making use of climatological data.

Frequently users of such data have found it necessary to spend a great deal of time establishing whether the criteria for observing or computing various elements have changed over the period of record or in what form the data are available.

It is therefore hoped that the presentation of this series may not only conserve valuable time but may have a direct influence in improving the accuracy of research results.

PREFACE

This bulletin presents a brief history of the more noteworthy publications issued by the Weather Bureau and devoted in whole or in part to the presentation of climatological data. Sale or subscription prices are included in some cases for historical information. Inquiries regarding the availability and current prices of any of the publications listed should be directed to the Chief, U. S. Weather Bureau, Washington 25, D. C.

J. H. Hagarty
Office of Climatology

ACKNOWLEDGMENTS

The section on the Weekly Weather and Crop Bulletin was prepared by John L. Baldwin, Editor, the section on Daily Series, Synoptic Weather Maps, Parts I and II by Harold S. Lippmann, the one on the Daily Upper Air Bulletin by J. S. Barry, the section on the Atlas of Climatic Charts of the Ocean by A. I. Cooperman, and the map on page 34 by J. P. Kohler, all of the Office of Climatology of the U. S. Weather Bureau.

TABLE OF CONTENTS

AIRWAY METEOROLOGICAL ATLAS FOR THE UNITED STATES AND NORMAL FLYING WEATHER FOR THE UNITED STATES

The Airway Meteorological Atlas presents graphically the results of two climatic studies over a network of Weather Bureau Airport Stations in the United States. The first study treats of average surface conditions of wind and weather, while the second deals with upper air winds based on tabulations of pilot balloon observations. Tables of upper air wind data are also given. The Atlas was prepared in projects of the U. S. Work Projects Administration and printed in 1941.

Normal Flying Weather for the United States was published in 1945. It was prepared in cooperation with the Army Air Force Weather Service and the Work Projects Administration. Tables present data on general weather conditions, ceiling height and visibility.

ATLAS OF CLIMATIC CHARTS OF THE OCEANS

The Weather Bureau's Atlas of Climatic Charts of the Oceans is a complete surface climatological study of all ocean basins, excluding the Arctic and Antarctic. These extensive summaries published in 1938 were made possible by Civil Works Administration and Works Progress Administration funds. This atlas sold for $2.00.

In 1943 the Weather Bureau published "Frequency Distribution of Air Temperatures over the North Atlantic Ocean, 1200 GMT". It contained monthly mean air temperature and the monthly range, as well as graphs of the distribution of the temperatures by 5° squares for the area between 40° and 75° N and between 0° and 80° W.

The U. S. Navy Marine Climatic Atlas of the World prepared by the Weather Bureau for the Navy will, when completed, supersede the Atlas of Climatic Charts of the Oceans. This complete and detailed climatological study (surface and upper air) intended for aerologists and meteorologists, will appear in seven volumes and include all oceans. At present volumes I, II, and III are available covering the North Atlantic, North Pacific, and Indian Oceans, respectively. The first volume was published in 1955 with the others scheduled at the rate of one a year. The atlas is available through the Superintendent of Documents at $8.00 per volume.

AVERAGE DAILY MAXIMUM TEMPERATURE IN THE UNITED STATES

Published in 1944 and using data for the period 1916 - 1935 this bulletin presents average daily maximum temperatures by weeks by climatological divisions.

A similar publication, "Average Daily Minimum Temperature in the United States" also issued in 1944 presents the same type of information for minimum temperatures for the same period.

AVERAGE MONTHLY SEASONAL AND DEGREE DAYS

This publication, as first issued, contained data based on the period 1899 to 1941, for first order Weather Bureau stations. It was revised once so as to be based on data through the 1945 - 1946 season.

AVERAGE PRECIPITATION IN THE UNITED STATES

This publication was prepared in cooperation with the Work Projects Administration and was published in 1944. It contains charts of average rainfall by weekly periods plus charts covering 4-week periods and showing patterns of precipitation intensity in terms of the average daily amounts recorded. Data used are for the period 1906 - 1935.

Included in this series were various types of bulletins, many containing climatological data. Three of the more important, Bulletins Q, R & W, are discussed elsewhere in this history. The following bulletins were published in the A-Z series.

A Summary of International Meteorological Observations. 1893.
B Surface Currents of the Great Lakes 1892-94. 1895.
C Rainfall and Snow of the United States, Compiled to the End of 1891, with Annual, Seasonal, Monthly and Other Charts. 1894.
D Rainfall of the United States with Annual, Seasonal and Other Charts. 1897.
E Floods of the Mississippi River. 1897.
F Vertical Gradients of Temperature, Humidity, and Wind Direction. Preliminary report on the kite observations of 1898, 1899.
G Atmospheric Radiation. A research conducted at the Alleghany Observatory at Providence, Rhode Island. 1900.
H West Indian Hurricanes. 1900.
I Eclipse Meteorological and Allied Problems. 1902.
J Wind Velocity and Fluctuations of Water Level on Lake Erie. 1902.
K Storms of the Great Lakes. 1903.
L Climatology of California. 1903.
M The Floods of the Spring of 1903 in the Mississippi Water Shed. 1904.
N Periodic Variation of Rainfall in the Arid Region. 1905.
O Temperature and Relative Humidity Data. 1905.
P Cold Waves and Frost in the United States. 1900.
Q Climatology of the United States. 1906.
R The Daily Normal Temperatures and the Daily Normal Precipitation of the United States. 1908.
S Report on the Temperatures and Vapor Tensions of the United States. Reduced to a homogeneous system of 24 hourly observations for 33-year interval 1873-1905. 1901.
T Frost and Temperature Conditions in the Cranberry Marshes of Wisconsin. 1910.
U Temperature Departures, Monthly and Annual in the United States, January 1873 - June 1901 inclusive. 1911.
V Frost Data of the United States and Length of the Crop-Growing Season, as Determined from the Average of the Latest and Earliest Dates of Killing Frost. 1911.
W Climatic Summary of the United States.
X Hurricanes of the West Indies. 1913.
Y The Ohio and Mississippi Floods 1912. 1913.
Z The Floods of 1913 in the Rivers of the Ohio and Lower Mississippi Valleys. 1913.

BULLETIN Q

Bulletin Q - "Climatology of the United States" by Professor Alfred Judson Henry was issued in 1906 and was the predecessor of Bulletin W. Data presented were generally for the period 1870-1903. The sale price was $10.00. The following introduction explains the purpose and scope of Bulletin Q.

INTRODUCTION.

The primary object of this work is to present in form for easy reference comparative climatic statistics for the different portions of the United States. The need of such a volume has been felt for some time, particularly within the Department. During the last few years the Bureau of Plant Industry has introduced a number of seeds and plants new to this country, as well as new varieties of plants and grains already well established. In order that the best results may be obtained, it is essential that the new plant or seed be placed in a climate closely resembling that of its original habitat. The Pomologist has likewise felt the need of more generalized climatic data than is afforded by the scattered publications of the weather service, and this is true in other lines of research that are being prosecuted by the Department.

Generally speaking, the statistics herein presented cover the period 1870–1903. Two distinct series of observations have been used: First, the observations made primarily for the synoptic weather charts during the period 1870 to 1903; second, the observations made by voluntary observers of the U. S. Weather Bureau for purely climatic purposes.

A word of explanation, as to the status of climatological observations in the United States, may not be out of place. In the early part of the nineteenth century persons interested in meteorology were simply observers of the weather and recorded those elements which truly serve as the fundamental data in climatic investigations. About 1830, at the beginning of the Redfield-Espy period, attention was drawn more and more toward observations bearing upon theoretical meteorology, and this state of affairs continued for upwards of twenty years, although the observations of the Medical Department of the Army were continued along substantially the lines laid down in the beginning. In 1842 the statistical information collected by the Medical Department of the Army was published by Dr. Samuel Forry in a work entitled "The Climate of the United States and its Endemic Influences." At that time, however, the study of meteorological observations was prosecuted mainly with a view of ascertaining the mechanism of storms, their mode of progression, and kindred facts, although the observations of the Medical Department lent themselves admirably to climatic studies. In 1857 Blodgett's Climatology of the United States, a volume of 536 pages, was published. In 1860 a report was issued by the Surgeon-General, U. S. Army, bringing the observational data down to 1860 and completing a period of about forty years continuous observations by the Medical Department. The civil war, 1861–1865, caused a hiatus in meteorological work in almost all sections of the country. At that time the Smithsonian Institution and three branches of the public service, viz, the Patent Office, the Medical Department of the Army, and the Lake Survey, were more or less active patrons and promoters of meteorological work. The Smithsonian Institution began the systematic collection of meteorological data in 1849 and continued actively engaged in the work for a period of twenty-five years. The results of its labors were given to the public in the Smithsonian "Contributions to Knowledge." Chief of these are "Tables of Rain and Snow in the United States;" "Tables, Distribution, and Variation of Atmospheric Temperature," and "Winds of the Globe."

On the organization of a Federal weather service the Smithsonian Institution relinquished its meteorological work and, in 1874, transferred its corps of observers to the Signal Service of the Army, then under Gen. Albert J. Myer. The Signal Service concerned itself chiefly with the issue of storm warnings and weather probabilities, and suffered its purely climatological work to lapse early in the eighties. Many of the observers who had formerly reported to the Smithsonian Institution became discouraged and ceased observing, and the original corps of Smithsonian observers was thus gradually reduced to a mere remnant of its orginal strength. A revival of interest in climatological work was manifest in the Signal Service under the administration of Gen. A. W. Greely, 1887–1891. The organization of the voluntary observers in each State and Territory into climate and crop services was begun under General Greely, and such organizations were greatly perfected and strengthened by the present Chief of the Weather Bureau. The two measures that have been most effective in increasing the efficiency of the climatological work, as now carried on, were the adoption of a uniform plan of observations in 1895 and the printing of monthly climatological reports which began in 1896. Summarizing the foregoing, it will be noted that climatological observations in the United States may be classed as follows:

First. The Medical Department of the Army made at military posts during the period 1820–1890.

Second. Those made by cooperating observers of the Smithsonian Institution 1849–1874.

Third. The Signal Service and the Weather Bureau, 1870 to date.

In point of homogeneity, the observations of the Army Medical Department stand first, but their geographic distribution is unfavorable to a general discussion of climate. The observations of the Smithsonian Institution were, as a rule, carefully made and quite complete as to details. The number of observing stations, however, varied from less than 100 in the earlier years to about 350 at the time the work was transferred to the Signal Service. The geographic distribution of the stations was also unfavorable, almost the entire number being in the middle and eastern portions of the country. The climatological observations of the Signal Service are fragmentary and are especially lacking in homogeneity. As before stated, it is only within the last ten or twelve years that uniformity, both in observing and recording climatological data has been attained, and this fact will in a measure explain why so few records exceeding fifteen years in length appear throughout the volume.

The first chapter deals with the broader features of the climate of the United States. It is intended to be read in connection with reports on the climate of the respective States, which appear in subsequent chapters. For convenience in grouping and discussion the country has been divided into six climatic districts, viz, the New England and Middle Atlantic States, the South Atlantic and East Gulf States, the West Gulf and Southern Rocky Mountain Slope, the North Central States, the Rocky Mountain and Plateau region, and the Pacific coast.

The ideal census of climatology, so to speak, is one that shall give the essential features for every county in each political division. The present status of climatological science in this country falls far short of this ideal, yet it has been thought advisable to append to the text matter of each State or Territory an alphabetical list of the counties in that State or Territory, arranged so that the reader can refer in a moment to the nearest county for which observations are available.

In the pages which follow the careful reader will observe an occasional repetition. These have been made to save frequent reference to previous pages.

The author's acknowledgments are due to the honorable the Secretary of Agriculture and the Chief of the Weather Bureau, under whose authority the work was carried on, to the officials whose names appear in connection with the special reports upon the climate of the several States and Territories, and to Miss Mattie H. Chapman, who rendered valuable aid in the initial stages of the work.

BULLETIN W - First Edition

The first issue of the publication commonly referred to as "Bulletin W" was called "Summary of the Climatological Data for the United States by Sections". It contained data from th beginning of record generally through 1908 or 1909 and was published in 1912. Issues did not carry a sales price. The following description of this series by Professor Frank H. Bigelow i carried in the bound volume.

SUMMARY OF THE CLIMATOLOGICAL DATA FOR THE UNITED STATES, BY SECTIONS.

By Prof. FRANK H. BIGELOW, in charge of the Climatological Division.

The climatological data of the United States, which have accumulated for the last half century, have been recently collected together in a series of summaries, 106 in number, covering the United States by sections, as given on the accompanying chart. It has been found convenient for various purposes to bring the data together for ready reference, in order that the numerous inquiries addressed to the Central Office or to the section directors may be more readily answered. The summaries also serve the purpose of special studies on the part of engineers and others interested in water resources, in farming operations, and in climatological matters generally. The records of the Central Office have been carefully compared with the retained copies on the stations, and all possible errors have been eliminated from these tables. The Annual Report of the Chief of the Weather Bureau will contain similar data for the years succeeding 1908, so that the record will be continuous for the future. The summaries contain a statement of the topographical and climatic features of the region, with remarks of a practical nature such as are likely to be of interest to the reader. The tables include the precipitation for the section, giving the monthly, annual, and average amounts of rain or the equivalent of snow in inches and hundredths. Some gaps which have occurred in the records are filled in by interpolation of data from surrounding stations, such interpolated values being printed in bold faced type.

A series of subordinate tables follow, giving (*a*) the average number of days with 0.01 inch or more of precipitation in each month; (*b*) the mean temperature; (*c*) the highest temperature; (*d*) the lowest temperature; (*e*) the average hourly wind movement in miles; (*f*) the mean relative humidity in percentage; (*g*) the prevailing wind direction; (*h*) the frost data, etc.

A brief summary of hydrographic data for the section, furnished by the United States Geological Survey, is added, which gives some of the relations between the precipitation and the discharge of the important rivers for each month, namely, the maximum, minimum, and mean discharge in second-feet; also per square mile, together with the run-off as depth in inches on the drainage area and total in acre-feet.

Diagrams are added showing the comparative monthly distribution of precipitation at a number of stations, and a chart showing the boundaries of the sections, the location and number of reporting stations, river systems, and general elevation above sea level.

These summaries will finally be brought together in a volume and this will give a history of the climate of the United States in as convenient a form for reference as is practicable.

The 106 climatological sections into which United States was divided are shown on page 32 of this history.

The second edition of Bulletin W was titled "Summary of the Climatological Data for the United States" by sections. Issues did not carry a sales price. The following description is reproduced from the introduction to this edition.

SUMMARIES OF CLIMATOLOGICAL DATA FOR THE UNITED STATES BY SECTIONS

The climatological data of the United States, which have been accumulating rapidly since the Weather Service was established as a national institution more than a half century ago, were first systematically collected and printed in Bulletin Q of the Weather Bureau about 1906.)

On account of the growing need for climatic information, it has been found necessary to supplement the data appearing in Bulletin Q by giving more detailed statistics and presenting them for smaller areas for convenience and economy in distribution.

To accomplish this most satisfactorily, it appeared best to divide the entire country into definite small areas and publish for each of these the essential facts about the climate as disclosed for all the observation points available in each area having records sufficiently long to give dependable information, usually not less than 10 years, except in newer-settled areas where five years of record were occasionally used.

The printing of these small monographs was first undertaken about 1908, when rapid development of southern Texas resulted in many calls for weather or climatic data from that part of the country. The first printed section embraced that area and was numbered 1, to be followed by number 2, covering western Texas and southern New Mexico, and later by others in numerical order, embracing the far western States and then districts to eastward until the entire country was covered, the numbers running consecutively up to 106, which latter embraces the State of Maine. The entire set, known as Bulletin W of the Weather Bureau, was originally bound in two volumes: Volume I, embracing all the sections west of the Mississippi River, Nos. 1 to 57, inclusive; and Volume II, all sections east of the Mississippi River, Nos. 58 to 106, inclusive.

These separates were printed in large numbers, but the demands for them were so widespread that it was necessary to reprint some of them several times in the following few years, and finally, by the close of 1920, it appeared desirable to reprint the entire set and bring the various tables down to the end of that year.

This work was much delayed on account of insufficient funds for printing, but was finally completed in 1925, a number of the sections last printed having the data brought down from one to three years later than 1920.

These summaries each contain a general survey of the topographic features of the section, a discussion of the climatic features based upon the previous weather records of the section, and full tables of the monthly and annual amounts of precipitation with averages for the period of observation, together with tables of snowfall, averages and extremes of temperature, averages of relative humidity, sunshine, winds, days with precipitation, details of excessive rainfalls, the dates of first and last killing frosts, length of growing season, and other weather phenomena. A chart showing the boundaries of the section, the location of the reporting stations, the drainage systems, and general elevation of the various portions above sea level accompanies each. Also the elevation of each reporting station above sea level is shown in the tables of monthly and annual precipitation.

For permanent filing and for use in answering inquiries concerning weather conditions, sets of these pamphlets have again been bound, but now in three volumes each, Nos. 1 to 30, inclusive, 31 to 68, and 69 to 106, the last including also similar summaries for Alaska, in three parts, and Hawaii, in one part. These sets are being supplied all important stations of the bureau.

March, 1926.

The same 106 divisions used in the first edition, and shown on page 32 of this publication, were used in the second edition.

BULLETIN W - Third Edition

The third edition of Bulletin W was called "Climatic Summary of the United States". It was priced at 10 cents per copy with reprints somewhat higher in price. It contained data from the establishment of stations through 1930. A different arrangement was used for climatological divisions than for the earlier editions. A map showing these divisions is reproduced on page 33 of the bulletin.

Alaska and Hawaii issues were not included in this edition, but there was an issue for the West Indies.

Each section contains a textual climatological summary followed by extensive data for specific stations. The following "Table of Contents" for section 66, Northern Indiana indicates the type of data presented in this edition.

TABULAR CONTENTS

The third edition is kept in print by reprinting as the supply becomes low, since the Bulletin W Supplement does not replace the third edition. Reprints are included in the "Climatography of the United States" series as No. 10 in that group. (See the section in this history on that series.)

BULLETIN W SUPPLEMENT

This is a supplement to the third edition and carries the title "Climatic Summary of the United States - Supplement for 1931 through 1952". Prices for the individual sections vary according to size, ranging from 20 cents to about 50 cents.

It presents the following material: (A.) Monthly sequential table of total precipitation and means for the 1931 - 1952 period, plus means for the period prior to 1931. (This is the only table for which monthly sequential data are presented.) (B.) Long term mean monthly and annual snowfall for the two periods, 1931 - 1952, and prior to 1931. (C.) Long term mean monthly and annual temperature for the two periods. (D.) Long term monthly mean maximum and mean minimum temperature for the two periods. (E.) Long term highest and lowest temperatures for the two periods. (F.) A station index and history table covering the 1931 - 1952 period. (G.) Reference notes. (H.) A location map.

Data are not included for first order stations. Data are included for all substations with five or more years of record during the 22 years covered. The supplement is issued as a part of the series "Climatography of the United States" (see section in this publication on that series) as No. 11 with the State indicated by the number following the serial number 11. The table below indicates the various numbers assigned:

Alabama 11-1	Kentucky 11-13	New Jersey 11-24	Tennessee 11-35
Arizona 11-2	Louisiana 11-14	New Mexico 11-25	Texas 11-36
Arkansas 11-3	Maryland and Delaware 11-15	New York 11-26	Utah 11-37
California 11-4	Michigan 11-16	North Carolina 11-27	Virginia 11-38
Colorado 11-5	Minnesota 11-17	North Dakota 11-28	Washington 11-39
Florida 11-6	Mississippi 11-18	Ohio 11-29	West Virginia 11-40
Georgia 11-7	Missouri 11-19	Oklahoma 11-30	Wisconsin 11-41
Idaho 11-8	Montana 11-20	Oregon 11-31	Wyoming 11-42
Illinois 11-9	Nebraska 11-21	Pennsylvania 11-32	Alaska 11-43
Indiana 11-10	Nevada 11-22	South Carolina 11-33	Hawaii 11-44
Iowa 11-11	New England 11-23	South Dakota 11-34	West Indies 11-45
Kansas 11-12			

At present the supplement has been issued or is in press for all States and Alaska. It has not yet been issued for Hawaii or the West Indies.

CLIMATE AND MAN

This is the 1941 Yearbook of the Department of Agriculture, and carried a sales price of $1.75 per copy. At the time the manuscript was prepared the Weather Bureau was a part of that Department. Climate and Man is divided into five parts:

1. Climate as a World Influence.
2. Climate and Agricultural Settlement.
3. Climate and the Farmer.
4. The Scientific Approach to Climate and the Weather.
5. Climatic Data.

The fifth section, Climatic Data, includes a wealth of facts about climate and weather in the United States, with special relation to agriculture. The three main divisions of this section are:

a. Selected material on climate in other parts of the world.
b. A set of climatic charts for the United States.
c. Statistical data for individual States and Territories.

Many of these sections have been kept in print as separates.

CLIMATOLOGICAL DATA

The predecessor of Climatological Data was a series of State Weather Service bulletins. The following list gives the beginning month and year of these bulletins for the various States:

State or Section	Bound Volumes in Office of Climatology file beginning with:
Alabama	October 1896
Alaska	Annual 1915 (Monthly issues started with Jan., 1917)
Arizona	October 1891
Arkansas	February 1893
California	September 1891

State or Section	Bound Volumes in Office of Climatology file beginning with:
Colorado	January 1888
Florida	October 1891
Georgia	October 1891
Hawaii	January 1905
Idaho	April 1893
Illinois	January 1879
Indiana	January 1887
Iowa	April 1890
Kansas	January 1887
Kentucky	January 1889
Louisiana	January 1888
Maryland and Delaware	May 1891
Michigan	April 1887
Minnesota	December 1884
Mississippi	January 1889
Missouri	July 1884
Montana	November 1891
Nebraska	August 1879
Nevada	February 1888
New England	November 1884
New Jersey	July 1884
New Mexico	August 1891
New York	June 1889
North Carolina	January 1887
North Dakota	July 1891
Ohio	October 1882
Oklahoma	July 1892
Oregon	April 1889
Pennsylvania	September 1887
South Carolina	February 1888
South Dakota	June 1889
Tennessee	February 1883
Texas	September 1888
Utah	September 1891
Virginia	July 1891
Washington	August 1891
West Indies	January 1906
Cuba and Puerto Rico	June 1899
West Virginia	January 1893
Wisconsin	January 1891
Wyoming	October 1891

(Some of the issues for the earlier months are not included in these bound volumes.) Annual issues were published for some but not all of these publications. In the earlier issues only a few station's data were published.

Beginning in February 1906 and ending in July 1909 the data were published by the Weather Bureau on a State basis in Climatological Service Bulletin, monthly and annual. From July 1909 through December 1913 data were included as a part of the Monthly Weather Review and presented on a drainage district basis. The twelve Districts used are:

District No.
1. North Atlantic States
2. South Atlantic and East Gulf States
3. Ohio Valley
4. Lake Region
5. Upper Mississippi Valley
6. Missouri Valley
7. Lower Mississippi Valley
8. Texas and Rio Grande Valley

District No. 9. Colorado Valley
10. Great Basin
11. California
12. Columbia Valley

Annual data were not included during this period. (An exception is that Climatological Service Bulletins, monthly and annual, were continued for Hawaii and Puerto Rico.)

Beginning with January 1914 Climatological Data has been published, monthly and annually, under that title, on a State basis. Climatological subdivisions were used in many of the early Climatological Service Bulletins, but were generally not used during the July 1909 - December 1913 period when data were included in the Monthly Weather Review. With the start of Climatological Data in January 1914 divisions were used in 29 States, by January 1930 in 31 States, and by January 1947 in 35 States. In most, but not all of the States the divisions were used in the climatological data table, the daily precipitation table and the daily temperature table.

From 1948 to 1955 a number of climatological divisions were changed, primarily to bring them into agreement with crop reporting districts used by the U. S. Department of Agriculture. Beginning in 1948, various months for different States, the divisions were used only in presenting data in the climatological data table. Stations in the other tables were arranged alphabetically by State.

In 1956 and 1957 all division boundaries were critically reviewed to conform with climate-influencing physical features (topography, moisture-sources, etc.) and, where practicable, with crop reporting district boundaries used by the Department of Agriculture. The resulting climatological divisions in use by January 1958, are shown on the map on page 34.

Climatological Data and the preceding publications present basic climatological data from various stations in an area, usually a State. Daily temperatures and precipitation values have been carried from the beginning with various additions and changes from time to time. Hourly precipitation data for recorder stations were included from 1948 (various months for the different sections) through September 1951. Beginning with October 1951 data hourly amounts were placed in a separate publication "Hourly Precipitation Data" (see that section of this publication).

At the end of 1957 the narrative weather story was discontinued, except when unusual or outstanding weather occurred.

As of January 1958, Climatological Data carried a table of State extremes, a supplemental table of wind, humidity, etc. for first order stations, a general data table presenting monthly information on a divisional basis, daily tables of precipitation, temperature, evaporation and wind movement, soil temperature, snowfall and snow on the ground, with isoline maps of average temperature and total precipitation. Corrections and delayed data have been carried in the June and December issues only, beginning in 1948. Before that corrections were carried irregularly. Seasonal snowfall and degree days are carried in the June issue while storage gage data are carried in July if available then. If they are not available then, storage gage data are carried in the August issue or as delayed data in December. A list of station name changes and relocations during the year is carried in each annual issue. The annual issue in addition to monthly and annual values of temperature, precipitation, evaporation, soil temperature and the isoline maps carries a table of freeze-free days and of temperature extremes. Each monthly issue of C.D. carries an index with non-meteorological information about each station, such as station number, county, coordinates, elevation, drainage, observer and times of observation. The annual Index carries somewhat similar information, including length of record.

Supplemental precipitation data consisting of precipitation measurements from unofficial sources are carried when storms of flood-producing proportions occur and the records usually included are not adequate to give a clear picture of the intensity and distribution of precipitation.

Location maps were carried irregularly in the earlier publications; in at least every annual from 1948 to the present; and in every issue beginning with July 1956 when total monthly (or annual) precipitation and average monthly (or annual) temperature isoline maps

were included. State averages were discontinued as of December 1955.

During 1948 the method of printing was changed from type-set to off-set. This, plus expansion of the number of pages, resulted in the capacity to carry data from far more stations. The number of temperature stations published have practically doubled as a result of this change.

Data are now published from nearly all official substations. As of December 1957 data were published from 3993 precipitation only stations, 5596 temperature and precipitation stations, 174 evaporation stations and 40 soil temperature stations.

Some indication of the change of the number of stations published in Climatological Data and earlier publications is given by the following figures which present the number of precipitation stations in the Missouri publication.

Month and year	No. of stations
July 1884	36
July 1894	127
July 1904	96
July 1914	84
July 1924	98
July 1934	119
July 1944	206
July 1954	229

While Climatological Data for most stations and sections began in January 1914, under that title, a few were started later. They are:

	Year
Alaska	Annual 1915 (monthly issues did not start
Pacific	Jan 1956 until Jan. 1917)
Puerto Rico and Virgin Islands	Jan 1955
National Summary	Jan 1950

The National Summary, started in January 1950, contains climatological data on a National basis, much of which had been previously carried in the Monthly Weather Review. Included are upper air and solar radiation data as well as detailed severe storm information. Excessive precipitation and other data formerly included in the "United States Meteorological Yearbook" are included in the annual issue. Effective with the August 1948 issue the price was set at 15 cents per copy, $1.50 per year, for all U. S. sections, with the Alaska, Hawaii and West Indies sections priced at 10 cents each, $1.50 per year. In June 1952 (July 1952 for Hawaii and September 1951 for West Indies) the rate for all sections was set at 15 cents per copy, $1.50 per year.

Prior prices were 5 cents per copy, 25 cents per year, back through October 1936, before that the price was 50 cents per year as far back as May 1928 (N. J. section) although many issues did not carry a price at all.

Beginning with August 1954, new prices were established, as follows: Single copies 20 cents each; yearly subscriptions $2.50. Prices for the National Summary were 15 cents per copy, $1.50 per year through July 1954 and 30 cents per copy, $4.00 per year from August 1954.

CLIMATOGRAPHY OF THE UNITED STATES

This series was established in 1955 to include summaries of data covering periods in excess of one year. Because the series will reflect climatic conditions and trends (as distinguished from the presentation of more or less current data) it does not include publications such as Climatological Data and Local Climatological Data. It does include Bulletin W Supplement, the Substation Climatological Summaries, and contemplated summaries of freezing data, extreme winds, hurricanes, etc.

The series numbering will comprise two sets of numbers, the first designating the publication, the second being the State number, e.g., 11-25, 20-41, 50-30, etc. The first number

denotes publications as follows:

10 Climatic Summary of the U. S., 1930 Edition (Bulletin W)
11 Climatic Summary of the U. S. (Bulletin W Supplement)
20 Climatological Substation Summaries
30 Summary of Hourly Observational Data (5-year summaries)
40 Climatic Guides for (city names)
50 Climatic Charts of the United States
60 Climates of the States
70 Storage Gage Records

The second number denotes States as follows, for all publications in the climatography series except Bulletin W and Bulletin W Supplement (for which a separate list is given in the Bulletin W Supplement section of this publication):

1 Alabama
2 Arizona
3 Arkansas
4 California
5 Colorado
6 Connecticut
7 Delaware
8 Florida
9 Georgia
10 Idaho
11 Illinois
12 Indiana
13 Iowa
14 Kansas
15 Kentucky
16 Louisiana
17 Maine
18 Maryland
19 Massachusetts
20 Michigan
21 Minnesota
22 Mississippi
23 Missouri
24 Montana
25 Nebraska
26 Nevada
27 New Hampshire
28 New Jersey
29 New Mexico
30 New York
31 North Carolina
32 North Dakota
33 Ohio
34 Oklahoma
35 Oregon
36 Pennsylvania
37 Rhode Island
38 South Carolina
39 South Dakota
40 Tennessee
41 Texas
42 Utah
43 Vermont
44 Virginia
45 Washington
46 West Virginia
47 Wisconsin
48 Wyoming
49 Alaska
50 District of Columbia
51 Hawaii
52 Puerto Rico and West Indies

The following publications have been issued as a part of this series:

10 A few reprints of the 3rd edition of Bulletin W
11 Bulletin W supplements for 42 sections.
20 Climatological Substation Summaries for over 170 substations. These present monthly sequential tables of temperature and precipitation plus long term averages of various elements along with a narrative climatological description, and a history of the station.
30 Summary of Hourly Observations for 114 first order Weather Bureau stations with 24-hourly observations during the 5-year period ending in 1954. Five frequency distributions of various weather elements are given for each month.
40 Climatic Guide for Baltimore, Md., presenting detailed climatological information for that city.

DAILY SERIES, SYNOPTIC WEATHER MAPS, PARTS I AND II

Part I, Northern Hemisphere Sea Level Charts and 500 Millibar Charts is a series of daily synoptic weather maps. Data tabulations for issues October 1945 and January 1946 through December 1951 are bound with the maps, and contain synoptic surface reports for 1230 GMT and synoptic upper-air reports for 0300 GMT. Each volume of the series consists of Northern Hemisphere maps for one month, there being one sea-level map and, beginning December 1944, one upper-air constant-pressure-surface map (500 millibars) for each day. Publication commenced in 1941, and the series now begins with January 1899 data. The sea-level maps in this series were prepared from data observed at or near 1230 GMT through March 1957. The 500-millibar maps were prepared from 0300 GMT data through December 1949, and from 1500 GMT data from January 1, 1950, through March 1957. Beginning with the maps for April 1, 1957, all observations were at 1200 GMT except those for stations operated by Canada and the United States. The time of these observations changed from 1230 GMT for sea-level and 1500 GMT for 500-millibars to 1200 GMT for both levels on June 1, 1957, unless otherwise indicated. The maps since January 1949 were produced by the Weather Bureau, while the earlier portion of the series was published by the U. S. Air Force. The size is 13 1/2" x 15", and the sales price is $2.75 per month.

Part II, Northern Hemisphere Data Tabulations is a continuation of the data listings that were bound with the synoptic weather maps. Publication began in January 1952, containing the same data as those previously accompanying the maps. Volumes were issued on a monthly basis, at $2.75 per month, through December 1953. Beginning with July 1955, Part II incorporated several features of the discontinued Daily Upper Air Bulletin. It was issued on a daily basis, containing both synoptic surface and upper air reports. The surface reports were for 1230 GMT, and the upper-air reports were for 0300 GMT (all observation times were included for the North American area). Beginning April 1, 1957, all stations except those operated by Canada and the United States furnished surface reports for 1200 GMT and upper-air reports for 0000 GMT. These countries changed in like manner on June 1, 1957; again, upper-air reports for all observation times were included for the North American area. The size was 8 1/2" x 11", and the price 25 cents a copy or $5.00 per month.

THE DAILY UPPER AIR BULLETIN

The Daily Upper Air Bulletin was published by the Weather Bureau from unchecked teletypewriter data August 13, 1948 through October 31, 1949, and was sponsored jointly by the Army, Navy, Air Force, and the Weather Bureau. The bulletin contained all of the 0300Z and 1500Z upper air data reported by North American stations.

A similar bulletin was published by the U. S. Department of the Navy from April 3, 1950 through June 30, 1954. This was the first attempt to collect and print by means of a direct teletype ditto process all of the 0300Z and 1500Z upper air data reported by teletype by North American stations.

The Weather Bureau resumed publication of this bulletin, with funds provided by the Air Force, on December 1, 1954 and discontinued it on June 30, 1955, using the same style and make-up employed by the Navy. Subsequent data are published as a part of Daily Series, Synoptic Weather Maps, Part II Northern Hemisphere Data Tabulations.

FIRST ORDER STATION ANNUAL SUMMARIES

The earliest yearly summary to which reference was found is for Nashville, Tenn. for the year 1909, although there may have been earlier issues for other stations.

The summary consisted of a table of monthly data on temperature, precipitation, wind, weather, etc. for the preceding year, with monthly sequential tables of temperature and precipitation. The publication was not standardized and various supplementary tables were added from time to time to meet local needs at individual stations.

The summary, called "Annual Meteorological Summary with Comparative Data" was not always issued every year. In some cases 2, 3, 5 or more years would elapse before the 'annual' was revised and reissued. An abbreviated summary carrying only data for the preceding year and called "Summary for the Year" was sometimes issued on a card for the in-between years. The summaries were printed at the various Weather Bureau Offices equipped with printing presses.

Effective with the summaries for 1949 a standard format was used and an annual issued every year for each first order station (almost without exception). The title was changed to "Local Climatological Summary" for 1949, 1950 and 1951 and to "Local Climatological Data" for 1952 and succeeding years. The publication now consists of a data table for the preceding year, a table of normals, means and extremes covering past years, monthly sequential tables of mean temperature, total precipitation, total degree days and total snowfall (if appropriate to the station) with a narrative description of the climate of the area and a table of location and changes during the history of the station.

It is now a 4 page 8 1/2" x 11" publication, printed at the National Weather Records Center at Asheville, N. C. and sent to all addresses on the mailing list for the station's summary 'Local Climatological Data'. The sale price was set at 10 cents in 1949 and at 15 cents beginning with the 1955 issue. Issues for 1948 and earlier years did not carry a sales price.

HOURLY PRECIPITATION DATA
(FORMERLY THE HYDROLOGIC BULLETIN)

The Hydrologic Bulletins, issued monthly, contain daily and hourly precipitation amounts on a drainage basis from a network of recorder stations. The publication was established in January 1940. The size of the bulletin was 8 1/2" x 14" until January 1946 when the method of presenting daily data was changed, and the size was also changed to 9 1/2" x 12". The December issue of the bulletin contains an Index of stations appearing in that year's issues. The series ended in 1948, as shown below, when the data were absorbed into the Climatological Data series.

District Number	District Name	First Issue	Last Issue
1	North Atlantic District	January 1940	July 1948
2	Southeastern District	January 1940	August 1948
3	Ohio River District	January 1940	August 1948
4	Upper Mississippi District	January 1940	July 1948
5	Missouri River District	January 1940	July 1948
6	Lower Mississippi West Gulf District	January 1940	July 1948
7	Southwestern District	January 1940	June 1942
8	Number was reserved for an additional district but was never used		
9	North Pacific District	January 1940	April 1948
10	South Pacific District	January 1940	July 1948

A number of supplements were issued to the bulletin, containing more detailed precipitation information for specific storms. These supplements are listed below:

LIST OF HYDROLOGIC BULLETIN SUPPLEMENTS

Storm of July 25 - 27, 1940	Northeastern Iowa and adjacent areas
Storm of August 6 - 10, 1940	Louisiana and adjacent areas
Storm of August 10 - 19 and August 28 - 31, 1940	Georgia, North Carolina, South Carolina, and Virginia
Storm of August 11 - 20, 1940	Ohio River Basin
Storm of August 25 - 31, 1940	Kentucky and Tennessee
Storm of September 3 - 4, 1940	Oklahoma and Kansas
Storm of November 21 - 27, 1940	Louisiana and Texas
Storm of December 1 - 16, 1940	Louisiana and Texas
Storm of April 13 - 20, 1941	Arkansas, Kansas, Missouri, and Oklahoma
Storm of May 20 - 28, 1941	Southeastern New Mexico
Storm of June 5 - 16, 1941	Illinois, Iowa, Kansas, Missouri, and Nebraska
Storm of August 28 - September 1, 1941	Minnesota, Wisconsin, and Upper Michigan
Storm of September 1 - 3, 1941	Kansas
Storm of September 20 - 24, 1941	Pecos River Basin
Storm of October 17 - 22, 1941	Northern Florida
Storm of October 19 - 22, 1941	Kansas
Storm of November 11 - 17, 1941	Oregon
Storm of January 22 - February 8, 1942	Northern California
Storm of April 14 - 18, 1942	Southeastern Florida Coast
Storm of May 16 - 23, 1942	New Jersey, New York, & Pennsylvania
Storm of June 14 - 18, 1942	Maine, New Hampshire, New York and Vermont
Storm of June 24 - 26, 1942	Parts of Illinois, Iowa, Kansas, Missouri, and Nebraska
Storm of July 6 - 11, 1942	Kentucky
Storm of July 17 - 18, 1942	New York and Pennsylvania
Storm of August 21 - 22, 1942	Michigan
Storm of September 15 - 19, 1942	Portions of Wisconsin, Minnesota, and Michigan
Storms of October 11 - 18, 1942	Potomac River Basin
Storms of December 26 - 29, 1942	Alabama, Georgia, and Mississippi
Storm of January 19 - 24, 1943	Sacramento Basin and Los Angeles
Storm of March 10 - 22, 1943	Ohio River Basin

Storm of May 5 - 21, 1943 (three sections)	Ohio & Lower Mississippi River Basin adjacent areas
Storm of June 7 - 14, 1944	Iowa, Kansas, Minnesota, Missouri, Nebraska, and South Dakota
Storm of June 17 - 19, 1946	Iowa, Kansas, Missouri and Nebraska

The last month for which hourly precipitation data were included in Climatological Data was September 1951. Effective with data for October 1951 these data were contained in a new publication "Hourly Precipitation Data". Hourly Precipitation Data contained hourly and daily precipitation amounts from recorder stations in the monthly issue. Monthly totals are carried in the annual issue, as well as a station index, location map and lists of station name changes and relocations during the year. Hourly Precipitation Data is issued on a State basis, with Maryland and Delaware combined into one bulletin and with the New England States also combined into one publication. It was issued for Alaska from October 1951 through the August 1952 issue when that particular section was discontinued.

The Hydrologic Bulletin did not carry a sales or subscription price. Hourly Precipitation Data does, 10 cents per copy or $1.00 a year, and this price has remained unchanged during the life of the publication.

INDEXES OF ASSEMBLED METEOROLOGICAL DATA RELATED TO HURRICANES

These pamphlets are designed to inform users of the collections of available publications and of microfilm of manuscript and autographic meteorological records along the path of specified hurricanes. Both surface and upper air records are included in the inventory. Indexes have now been published for the following named hurricanes:

"Carol" August 1954	**"Ione" September 1955**	**"Flossy" September 1956**
"Hazel" October 1954	**"Janet" September 1955**	**"Audrey" June 1957**
"Connie" and "Diane" August 1955	**"Betsy" August 1956**	

The following Contents table is taken from the Index of data for hurricane "Janet" and illustrates the type of material included in this series of publications.

CONTENTS

(Continued on page 17)

As other material is received at the National Weather Records Center additional sections to this publication will be issued.

PUBLICATIONS AND PRINTED CHARTS

Climatological Data National Summary September 1955 Vol 6 No 9.

Climatological Data Bulletins and/or Hourly Precipitation Bulletins for September 1955.

Florida
Texas
Puerto Rico and Virgin Islands

Northern Hemisphere "Daily Series Synoptic Weather Maps", Part I, 1230 GCT sea level synoptic maps and 1500 GCT 500 millibar maps for September 1955.

Northern Hemisphere "Daily Series Synoptic Weather maps", Part II, data tabulations for September 1955.

Mexican daily sea level Synoptic Weather Maps, 1230 GCT, prepared by the "Servicio Meteorologico, Mexicano", September - October 1955.

INVENTORY OF UNPUBLISHED CLIMATOLOGICAL TABULATIONS

This inventory, published in 1954, lists in 10 sections various unpublished climatological tabulations available at the National Weather Records Center at Asheville, North Carolina. The sections may be obtained from the U. S. Government Printing Office at 5 cents per section, except 20 cents for Section 1 (including 1A) and 15 cents for Section 2. The sections are as follows:

Section 1. Navy Summaries of Monthly Aerological Records (SOMAR), and stations for which available.

Section 1.A Navy Summaries of Monthly Aerological Records, Revised (SMAR), and stations for which available.

Section 2. Air Force Summaries of Surface Weather Observations (A-B Summaries), and stations for which available.

Section 3. Weather Bureau Wind Summaries by Combined Velocity Groups (1139D), and stations for which available.

Section 4. Summaries of General Weather Conditions, Ceiling Heights and Visibilities, Monthly (1141A) and Annual (1141C), and stations for which available.

Section 5. Ceiling-Visibility-Wind Tables by Combined Velocity Groups, and stations for which available.

Section 6. Surface Wind Summaries for Specified Ceiling and Visibility Conditions, and stations for which available.

Section 7. Frequency Distribution of Psychrometric Values (ASHVE Tables), and stations for which available.

Section 8. Winds Aloft Summaries (WBAN-22), and stations for which available.

Section 9. Summaries of Constant Pressure Data(WBAN-33), and stations for which available.

Section 10. Upper Air Wind Summaries (1117), and stations for which available.

LOCAL CLIMATOLOGICAL DATA
(FORMERLY MONTHLY METEOROLOGICAL SUMMARY AND STATION METEOROLOGICAL SUMMARY)

Remarks concerning this bulletin for the early years are based on the publication for Indianapolis, but are believed to be generally applicable to all stations. The earliest published Station Meteorological Summary, known as Form 1030, available to the writer is for March 1897 for Indianapolis. Instructions on the back of the form state that a copy should be sent to the Chief of the Bureau on the first day of the succeeding month.

Daily values of maximum, minimum and mean temperature, precipitation and cloudiness were given, with summarized data for the current month, and with mean temperature and total precipitation data for each March from 1871 on.

A typewriter was first used in preparation of the Indianapolis Form 1030 for the month of June 1904.

Daily sunshine was added in November 1907.

Hourly precipitation and temperatures were included in the Indianapolis summary beginning in January 1930, but it was a number of years before these data were generally included in the mimeographed summary for all stations.

Stations equipped with a printing press were allowed to print their own summary, including all data on the standard form; a card could be used, provided it was one-fourth the size of the regular form.

Form 1030 was discontinued and Form 1001C "Station Meteorological Summary" substituted during 1949 (August at Indianapolis). Form 1001C, while quite similar to Form 1030, did not carry comparative data for preceding years. Blank columns were included for additional data desired locally.

At the time of the change, the deadline on issuing the monthly summary was dropped since the Station Meteorological Summary was then printed at Weather Records Processing Centers and it was no longer possible to issue it on the first of the succeeding month.

Hourly precipitation data were not included on Form 1001C until May 1950. At the time Form 1001C was started, 1949, a companion publication, "Special Meteorological Summaries" was issued. This publication contained hourly temperatures, 6-hourly synoptic data and various frequency distribution tables. At first it was issued only for selected stations, but beginning with January 1953 this was extended so that the Supplement was issued for all stations taking 24 hourly observations. Beginning with July 1956 the following hourly data were included in the Supplement for all Weather Bureau stations taking 24 hourly observations: sky cover, station pressure, dry bulb, wet bulb, relative humidity, dew point, wind direction and speed. Beginning in July 1957, hourly ceiling and visibility values were added. Effective with the publications for January 1952 the use of the form number "1001C" was discontinued on the publication and the title was changed to "Local Climatological Data" and "Local Climatological Data Supplement".

Form 1030 for Alaskan stations was continued through August 1952 when the change to Local Climatological Data was made.

As of January 1958 the LCD monthly was published for 282 stations, the supplement for 194, and the annual for 284.

No sale or subscription price was set for the summary prior to July 1949. Effective with July 1949 prices were established at 5 cents per copy (monthly and supplement, if issued) and 50 cents per year (monthly, supplement and annual). The price of the annual alone was 10 cents.

Beginning with the July 1954 issue the price was 10 cents for single copies of the monthly, the supplement or the annual. Subscriptions were then $1.00 per year for the monthly and annual, $1.00 per year for the supplement and annual, and $1.50 per year for monthly, supplement and annual.

Beginning with the July 1955 issue a single subscription price of $1.50 per year was set regardless of whether or not a supplement was issued. Single copies were then 15 cents per monthly issue (both monthly and supplement if issued) and 15 cents for the annual. (See the section in this publication on First Order Station Annual Summaries.)

MARINERS WEATHER LOG

The Mariners Weather Log is a bimonthly publication providing information on weather over the oceans and over the Great Lakes. It includes gale data, for the Atlantic and Pacific Oceans, articles of current interest, items on marine meteorology or of historical background information, along with a Rough Weather Log covering three recent months and a Smooth Weather Log covering the two months preceding the rough log. The first issue, Volume 1, Number 1 was for January 1957. The price for this publication is 20 cents per issue, or $1.00 per year.

MONTHLY CLIMATIC DATA FOR THE WORLD

Volume 1, Number 1 of this publication was issued for May 1948 under the title "Monthly Climatic Data for World by Continents". It was a 4-page mimeographed publication containing mean temperature and total precipitation data and departures from normal for 116 selected stations in North America, South America and Europe. The title was changed to "Monthly Climatological Data for the World" with the July 1948 issue; to "Monthly Climatic Data for World" with the August 1948 issue and to the present title "Monthly Climatic Data for the World" with the May 1949 issue.

Australian data were included in the June 1948 issue as well as a textual summary of temperature and rainfall anomalies.

By August 1948 the publication had increased in size to 8 mimeographed pages and carried data for 171 stations.

The textual summary was omitted in October 1948, but resumed the following month.

Effective with December 1948, latitude, longitude, station elevation and sea level barometric pressure and humidity and precipitation quintiles were added. Upper air data (average height, temperature and dew point at the levels of 850 mb, 700 mb, 500 mb, 300 mb, and 200 mb) were first carried in January 1949. That issue, 19 pages in size, carried upper air data for 75 stations in the Upper Air section. Upper air data for the 150 and 100 mb level were included beginning with September 1956.

A price of $1.00 per year domestic, $1.80 foreign, was established with the March 1949 issue. This price was changed to 25 cents per copy, $2.75 per year, domestic $3.75 foreign with the August 1954 issue.

The March 1949 issue, under the Preface, states that the bulletin may consist of as many as 5 parts arranged in the following order.

I. A brief summary of surface temperature (°F) and precipitation conditions and anomalies as observed from the plotted "Climat" data.
II. Surface"Climat" data for the current month arranged by continent and adjacent ocean areas, and by countries within the continent. The following order is observed: North America, South America, Europe, Africa, Asia and Australia including Pacific Islands not included with one of the other continents.
III. Upper air temperature, dew point (°C) and height of the 850, 700, 500, 300, and 200 mb. surfaces. The 150 and 100 millibar surfaces were included beginning with September 1956 data. Resultant wind directions and speeds for all surfaces were also included beginning with September 1956 data.
IV. Delayed reports for the current month received too late to be included in the general table or considered in the summary.
V. Late reports for the preceding month added for documentation.

The bulletin was reproduced by printing beginning with the April 1950 issue. That issue contained 15 pages with current surface data for 666 and upper air data for 133 stations, plus delayed surface data for 272 and delayed upper air data for 8 stations.

The textual summary was discontinued with the January 1954 issue, with the following explanation carried in the October, November and December 1953 issues: "The 'General Summary' heretofore carried in this publication, will be discontinued after December 1953. This summary has necessarily been based largely on the information of departures from the normals of temperatures and precipitation, shown in the tables. There are great gaps in the data on these departures; hence, any textual summary must fail to reflect the full import of the tabulated data taken as a whole."

Beginning with the January 1956 issue, the bulletin was sponsored by the WMO and carried this legend on the cover:

"Sponsored by World Meteorological
Organization In Cooperation with
U. S. Weather Bureau"

The November 1957 issue contained current surface data for 1013 stations and upper air data for 300 stations.

The first issue of the Monthly Weather Review was for July 1872. The first issues, from the Office of the Chief Signal Officer, War Department consisted of only one page containing a narrative section on storms, rainfall and temperature.

Although volume numbers were not carried in the early issues, the issues from July 1872 through December 1873 are considered as Volume 1. The following table gives the key to Volume numbers:

VOLUME	YEAR	VOLUME	YEAR	VOLUME	YEAR
1	1872-73	7	1879	31	1903
2	1874	8	1880	41	1913
3	1875	9	1881	51	1923
4	1876	10	1882	61	1933
5	1877	11	1883	71	1943
6	1878	21	1893	81	1953
				85	1957

For many years, through Volume 77 (1949) the Review presented climatological data monthly as well as articles pertaining to meteorology, agriculture, transportation, water uses and resources, forestry and similar subjects. In addition annual data and/or charts were carried in the December issues for many of the volumes. Annual data were carried in the 13th issue from Volume 21 through Volume 36.

Detailed data from substations were published on a State basis from Volume 12, No. 10 through Volume 35. From Volume 37, No. 7 through Volume 41 detailed substation data were included on a drainage district basis (see the section in this publication on Climatological Data).

Effective with Volume 78 (1950) the climatological data were discontinued in the Review and included in a new publication "Climatological Data, National Summary". The Review continues to review the weather of the month and to publish contributions to meteorological science, particularly articles on synoptic and applied meteorology as well as various climatological charts.

Listed below is a resume of climatological data carried in the Review:

Precipitation

A description of the month's precipitation was carried each month in Volumes 1 through 60. Various tables and/or charts were carried from Volume 10 through Volume 77, with charts only from Volume 78.

Temperature

A description of the month's temperature is carried each month in Volume 1 through Volume 60. Various tables and/or charts were carried from Volume 10 through 77, with charts only from Volume 78.

Pressure

A description of the month's pressure is carried each month in Volume 2 through Volume 57. Various tables and/or charts were carried from Volume 11 through Volume 77, with charts only from Volume 78.

Storms

A descriptive text on storms was carried from Volume 16, No. 2 through Volume 58. A table of severe local storms was carried beginning with Volume 49, No. 6 and continuing through Volume 77.

Upper Air Data

These were carried in tabular form from Volume 50 through 77, and in chart form from Volume

67 to date. (Temperature and pressure charts at 3500' and 10,000' appear from Volume 31 through Volume 33.) Beginning with Volume 67 charts of temperature and pressure appear for 5000 ft. (1524 m) 3000, 4000, and 5000 meters. With Volume 68 these were changed to 1500, 3000, 5000 and 10,000 meters. There was a break from Dec. 1942 through Dec. 1943 but these were printed later in Volume 72 (1944). Beginning with Jan. 1946 (Volume 74) the charts were changed to show heights of the constant pressure surfaces 850 millibar, 700, 500, and 300 mb. The 200 and 100 mb. levels were added beginning June 1956.

In addition, various other tables and charts were presented from time to time. Included were data on aurorae, hailstorms, ice, relative humidity, rivers and floods, water temperature, snowfall, sunshine, wet bulb temperature, wind, and solar radiation. A chart of total solar radiation received was begun in Volume 79. Cyclone track charts were included from Volume 1, Oct. 1872 to the present.

MONTHLY WEATHER REVIEW SUPPLEMENTS

Monthly Weather Review Supplements were issued from 1914 to 1949 to make available studies which appeared to form permanent contributions to the science of meteorology. Prices varied from ten cents to one dollar.

These supplements have been succeeded by the Technical Papers series.

A list of the 48 numbered supplements issued follows. Note that Supplement No. 43 was not published.

No. 1. Types of Storms of the United States and their Average Movements. 1914. Bowie and Weightman.

No. 2. I. Calendar of the Leafing, Flowering and Seeding of the Common Trees of the Eastern United States. II. Phenological Dates and Meteorological Data Recorded by Thomas Mikesell at Wauseon, Ohio. 1915. Smith.

No. 3. (Aerology No. 1.) I. Sounding Balloon Ascensions at Fort Omaha, Nebr., May, 1915. II. Meteorological Observations on Board the U.S.C.G. Cutter Seneca, April-July 1915. III. Drexel Aerological Station. IV. Free Air Data at Drexel Aerological Station, October, November, and December 1915. 1916.

No. 4. Types of Anticyclones of the United States and their Average Movements. 1917. Bowie and Weightman.

No. 5. (Aerology No. 2.) Free-Air Data at Drexel Aerological Station: January, February and March 1916. 1917.

No. 6. Relative Humidities and Vapor Pressures over the United States, including Discussion of Data from Recording Hair Hygrometers. 1917. Day.

No. 7. (Aerology No. 3.) Free-Air Data at Drexel Aerological Station April, May and June 1916. 1917.

No. 8. (Aerology No. 4.) Free-Air Data at Drexel Aerological Station: July, August, September, October, November, and December 1916. 1918.

No. 9. Periodical Events and Natural Law as Guides to Agricultural Research and Practice. 1918. Hopkins.

No. 10. (Aerology No. 5.) Free-Air Data at Drexel Aerological Station: January, February, March, April, May and June 1917. 1918.

No. 11. (Aerology No. 6.) Free-Air Data at Drexel Aerological Station: July, August, September, October, November, and December, 1917. 1918.

No. 12. (Aerology No. 7.) I. Free-Air Data at Drexel, Nebr., and Ellendale, N. Dak., Aerological Stations. January, February and March, 1918 inclusive. II. Free-Air Temperatures During the Cold Winter of 1917-18. III. The Ellendale Aerological Station. 1918.

No. 13. (Aerology No. 8.) I. Free-Air Data at Drexel and Ellendale Aerological Stations: April, May and June 1918. II. Notes on Kite Flying. 1918.

No. 14. (Aerology No. 9.) I. Free-Air Data at Broken Arrow, Oklahoma, Drexel, Nebr., Ellendale, N. Dak., and Royal Center, Ind., Aerological Stations, July, August, and September 1918 inclusive. II. Broken Arrow Aerological Station. III. Royal Center Aerological Station. 1918.

No. 15. (Aerology No. 10.) I. Free-Air Data at Broken Arrow, Oklahoma, Drexel, Nebr., Ellendale, N. Dak., Groesbeck, Tex., Leesburg, Ga., and Royal Center, Ind., Aerological Stations, October to December 1918 inclusive. II. The Groesbeck Aerological Station. III. The Leesburg Aerological Station. 1919.

No. 16. Predicting Minimum Temperatures from Hydrometric Data. 1920. Smith et al.

No. 17. Stream Flow Experiment at Wagon Wheel Gap, Colo. 1922. Bates and Henry.

No. 18. Bibliography of the Climate of South America. 1921. Welch.

No. 19. Thermal Belts and Fruit Growing in North Carolina. Cox. Appendix: Thermal Belts from the Horticultural Viewpoint. Hutt. 1923.

No. 20. An Aerological Survey of the United States. Part I. Results of Observations by Means of Kites. 1922. Gregg.

No. 21. The Preparation and Significance of Free-Air Pressure Maps for the Central and Eastern United States. 1922. Meisinger.

No. 22. The Spring Floods of 1922. 1923. Frankenfield et al.

No. 23. The Temperature of Mexico. 1923. Hernandez.

No. 24. West Indian Hurricanes and other Tropical Cyclones of the North Atlantic Ocean. 1924. Mitchell.

No. 25. Normals of Daily Temperature for the United States. 1925. Marvin and Day.

No. 26. An Aerological Survey of the United States. Part II. Results of Observations by Means of Pilot Balloons. 1926. Gregg.

No. 27. Montezuma Pyrheliometry. 1926. Abbot.

No. 28. Climatological Data for the Tropical Islands of Pacific Ocean (Oceania). 1927. Reed.

No. 29. The Floods of 1927 in the Mississippi Basin. 1927. Frankenfield.

No. 30. Forest and Stream-Flow Experiment at Wagon Wheel Gap, Colo. Final Report on Completion of the Second Phase of the Experiment. 1928. Bates and Henry.

No. 31. Climatological Data for Northern and Western Tropical South America. 1928. Reed.

No. 32. Climatological Data for Southern South America. 1929. Reed.

No. 33. Climate of Mexico. 1930. Page.

No. 34. The Daily, Monthly, and Annual Normals of Precipitation in the United States, Based on the 50-year Period, 1878 to 1927 inclusive. 1930. Day.

No. 35. Upper-Air Wind Roses and Resultant Winds for the Eastern Section of the United States. 1933. Stevens.

No. 36. Winds in the Upper Troposphere and Lower Stratosphere over the United States. 1937. Stevens.

No. 37. The Ohio and Mississippi River Floods of January-February 1937. 1938. Swenson.

No. 38. Summary of Aerological Observations Obtained by Means of Kites, Airplanes, and Sounding Balloons in the United States. 1938. Lennahan.

No. 39. Reports on Critical Studies of Methods of Long Range Weather Forecasting. 1940.

No. 40. Data from Aerological Soundings at Fairbanks, Alaska, During the Winters 1936-1937 and 1937-38. 1940.

No. 41. Meteorological Results of the Byrd Antarctic Expeditions 1928-30, 1933-35. Tables. 1939. Grimminger and Haines.

No. 42. Meteorological Results of the Byrd Antarctic Expeditions 1928-30, 1933-35; Summaries of Data. 1941. Grimminger.

No. 43. Unpublished. (Copy of manuscript on file in Weather Bureau Library.)

No. 44. Fifty Years' Weather in Kansas City, Missouri, 1889-1939. 1941. Hamrick and Martin.

No. 45. Preliminary Studies on Seasonal Weather Forecasting. 1941. Weightman.

No. 46. Observations of Nocturnal Radiation at Fairbanks, Alaska, and Fargo, N. Dak., 1941. Wexler.

No. 47. The Circulation of the Atmosphere in High Latitudes During Winter. 1941. Byers and Starr.

No. 48. Meteorological Data for Little America. Tabular and Graphical Results of Observations made at the West Base of the United States Antarctic Service Expedition of 1939-41. 1949. Court.

NORMALS PUBLICATIONS

In 1891 the newly established Weather Bureau adopted the practice, originated by the Signal Corps, of using moving averages as normals for both temperature and precipitation. The period of this practice extended from 1870 through 1906. Departures from these averages were published in Climatological Bulletins, the Monthly Weather Review, and the Reports of the Chief of the Weather Bureau. In 1907 the Bigelow (Frank Nagar Bigelow) system of normals was adopted. The following is Bigelow's Introduction to Bulletin R "The Daily Normal Temperature and The Daily Normal Precipitation of the United States".

THE NORMALS OF THE DAILY TEMPERATURE AND THE DAILY PRECIPITATION IN THE UNITED STATES.

The temperature data contained in the report on temperatures and vapor tensions of the United States, reduced to a homogenous system, gave the values for each month of the year and generally for the period 1873 to 1903. In the compiling of the climatological bulletins, which show a variation of the temperature and the precipitation for the current week, being published weekly, it is necessary to have normals which are available for any successive seven days which may occur in the year. For this purpose the monthly normals have been extended to normals available for each day of the year. In the case of the temperature this was accomplished by plotting down on a large sheet the monthly normals, drawing a curve through the twelve points representing the months, and then scaling off the temperature for each day. The monthly means were then taken from these values, and in case of any discrepancy between these monthly means and the original monthly normals the curve was slightly adjusted, so that these two monthly means should be in very close agreement. The tables of the daily normal temperatures for the several stations, giving the temperature each day to the nearest degree, were obtained in this manner.

In forming the daily normals of precipitation, the procedure was of a different character. For each station all the records of precipitation for each day in the year were collected together, using the entire available series during which observations were made at a given station. The daily means of these data were taken, and the result of plotting these values in a curve shows that the record is by no means long enough to give a true normal value, the curve being generally rough and consisting of broken lines. This is due chiefly to the fact that occasionally the effect of a storm is to produce excessive local precipitation on the given date, but as the occurrence of this storm is more or less accidental at a given place it will require many more years of observations to eliminate this irregularity than we now possess. In order to approximate closely to the daily normal values which would be derived from a very long series of observations of precipitation, covering two or three centuries, it was thought proper to use the mean values of successive eleven dates that is, beginning with January 1 to 11, inclusive, the mean precipitation was taken and entered against January 6; then taking January 2 to 12, inclusive, the

mean precipitation for these dates was entered against January 7; and in this way the normal values were obtained for each day in the year. This smoothing process evidently tends to spread the excessive values of individual dates backward and forward through ten dates on each side of their occurrence, and this well-known process gives a very close approximation to the mean curve which would result from a very much longer series of actual observations.

In the cases of stations of short record, as compared with many stations covering thirty-three years, the following process was adopted for adjusting short records of precipitation to the corresponding long records:

A series of charts were prepared for every tenth day, as January 1, January 11, January 21, February 1, etc., on which were entered the values of the precipitation for every tenth day, using all the stations of long record, which covered the map of the United States quite fully. Then the values for each tenth day of the station with short record were compared with those in its neighborhood, and such adjustments made as seemed to be justified. The daily normals were then interpolated between these 10-day values, in every case being guided by the trend of the corresponding daily normals of the neighboring stations of long records.

These tables of daily normal temperature and precipitation are now in use in the climatological work of the Bureau throughout the United States, and they have superseded all the daily normals which were prepared several years ago from much less extensive data than were available in the formation of these tables.

I have been assisted by Mr. H. L. Heiskell and Mr. C. Grant Bigham in the preparation of this report.

The second nation-wide set of normals adopted by the Weather Bureau were based, for temperature, on the 46-year period July 3, 1875 to July 2, 1921. For precipitation, they were based on the 50-year period 1878-1927 inclusive. Temperature normals were published for 161 stations as Monthly Weather Review Supplement No. 25, while precipitation normals were published for 199 stations as Monthly Weather Review Supplement No. 34. The Introductions to these Supplements follow:

MONTHLY WEATHER REVIEW—SUPPLEMENT NO. 25

NORMALS OF DAILY TEMPERATURE FOR THE UNITED STATES, 46-YEAR PERIOD, JULY 3, 1875 TO JULY 2, 1921

A true normal daily temperature can be computed with entirely sufficient accuracy only from a long series of values of 24 hourly temperatures for each day, derived from the maintenance of automatically-recording thermometers.

While the Weather Bureau has records of this character covering periods of 20 years or more at many stations, these are insufficient in number to adequately represent the details of climatic conditions of a great area like the United States, the period of time covered by such data is too short, and especially the labor of computing normals from hourly readings is too enormous to justify their general use for that purpose. On the other hand, observations of the daily extremes of temperature are available for probably as many as 10,000 stations for periods ranging from a few years in many cases to 50 years or more in a considerable number of cases. In addition, other observations at stated hours are also available and serve to fix appropriate diurnal normals which are nearly identical with so-called true normals derived from 24-hourly readings. In presenting the present series of station normals based on daily observations of the maxima and the minima of temperature, the close relation between such values and those based on hourly readings will be indicated, at least for the United States.

Previous normals.—Bulletin R of the Weather Bureau, published in 1908, contained tables of the daily normal temperatures based upon a 33-year record, 1873 to 1905, inclusive. These daily values were obtained by charting on large sheets of cross-section paper the average temperature for each of the 12 months, drawing a smooth curve through these values, and scaling therefrom the approximate daily averages. This plan is objectionable in that each of the 12 points on the scale indicating the values for the respective months covered too great a period in days to enable the approximate location of the points of highest and lowest temperatures, or to give an adequate idea of the rates of change during the various portions of the months. Furthermore, the length of record at that time, 33 years only, is recognized as too short to give dependable values from computed actual daily means.

The monthly means used in computing the values appearing in Bulletin R were obtained from the tri-daily observations, 7 a. m., 3 p. m. and 11 p. m., 75th meridian time, for the period 1873 to June, 1888, inclusive, and from the mean of the daily maximum and minimum temperatures from July, 1888, to the end of 1905. As the observations at stated hours were necessarily made at the same moment of time over all portions of the country, there was a constant and increasing earlier occurrence of the hours of observation to the westward. That is, at the first observation of the day, made at 7 a. m., say, for Philadelphia; the local time of observation at St. Louis would be an hour earlier, or 6 a. m.; at Denver it would be 2 hours earlier, or 5 a. m., and in California 3 hours earlier, or at 4 a. m.; the same conditions apply to the other observations. The means obtained from these data are, therefore, not strictly homogeneous throughout all parts of the country, due to the earlier hours of observation over the western portions.

In the early days of the service the means determined from the maximum and minimum readings were mainly worked out after the last observation of the day, usually 11 p. m. Later,

when self-recording instruments were introduced, the extremes were determined from midnight to midnight, local standard time. As both the maximum and minimum temperatures for the day usually occurred before the last observation, it is thought no important differences exist in the resulting means obtained from these readings over the different parts of the country.

With nearly 50 years of record now available for many stations it is possible to compute averages with considerable accuracy and the mean daily values submitted herewith are based upon averages uniformly determined from the daily extremes, and covering the period July 3, 1875, to July 2, 1921, 46 years of record. This series of means, unlike any previously used, as stated above, is practically homogeneous throughout the period of years considered, and the data from all parts of the country are placed upon a strictly comparable basis. The differences between the means obtained from the daily extremes and the true means, determined from hourly observations throughout the entire 24-hour period, are materially affected by local topography, distance from large bodies of water, etc. These differences were carefully analyzed by Professor Bigelow, appropriate corrections to the 24-hour means determined by him, and set forth by charts in Bulletin S of the Weather Bureau. The charts are reproduced here, and show how small the corrections generally are for the continental United States; on account of this smallness they have not been incorporated in the present tables.

Terminal adjustment.—Every complete cycle like the annual march of temperature must, of course, close upon itself, that is, the normal value for a given day at the beginning of the cycle must be identical with the value for the same day one year later. Average values for corresponding days even when derived from a long series of observations rarely or never satisfy this requirement. Quite a common practice among students in such cases consists in adjusting the two terminal values of the cycle to identity by distributing the discrepancy proportionately to all intermediate values of the whole series. This practice really has no physical basis of justification whatever in the case of many years of observations, because the discrepancy in question is characteristic of only a few values of the data immediately contiguous to the terminal values. Therefore, it is best in such cases to make no correction at all for terminal inequality, but to begin and end the cycle at a time when conditions fluctuate the least, that is, the summer season in the present case. Any outstanding discrepancy in the data itself will then be best disposed of by the subsequent mathematical analysis or by the drawing of smooth curves if that method is employed.

Choice of phase interval.—The superior advantages of the week as a sub-unit for the detailed analysis of the annual march of temperature are largely self-evident and were convincingly presented by one of the writers in the MONTHLY WEATHER REVIEW, August, 1919, **47**: 544–555. Accordingly, this unit was adopted and daily averages of the maximum and minimum temperatures were prepared separately at all stations having 20 years of record or more. From these, weekly averages were computed. Although the schedule of weeks begins with January 1 to 7, so as to fit the calendar year, the tabulation of the data was made to begin with the week comprising the days July 3 to 9, so as to avoid the large terminal discrepancies which arise from a tabulation by calendar years. In leap years the temperature for the 29th day of February was merged at ¼ weight with the week naturally comprising that date. Furthermore, the extra day over 52 weeks in all years was merged as an 8th day in the week beginning April 16. This date was chosen because the mean temperature for the year occurs about at this time and the inclusion of the extra day then would make the mean of the 52 weekly values of the data most nearly identical with the mean of the 365 individual days.

On account of the varying dates attending the beginning of observations at the respective stations it was considered that all stations having from 40 to 45 years of record were of sufficient length to give normals that would not be appreciably changed by the addition of the few years necessary to complete the full 46-year period. Of the stations appearing in the following tables, 93 had lengths of record varying from 40 to 46 years; the remainder, or 71, had lengths of record ranging from 20 to 39 years, and in these cases the records were corrected to the full 46-year period by the usual methods employed in such cases, that is, by comparing the shorter series with similar periods for near-by points and determining and applying the corrections necessary to reduce the weekly values to the full period of 46 years.

In accordance with the plan described in the foregoing, there were derived 52 weekly values of maximum and mininum temperatures for a total of 164 stations, well distributed over the continental United States and including the stations at Honolulu and San Juan, all (except the two last mentioned) adjusted to a period of 46 years. These constitute extremely valuable basic meteorological data and it is contemplated to publish them separately in full, together with a discussion of the residuals from the harmonic analysis and smooth curves.

METHODS OF ANALYSIS

Two methods were employed to derive daily normals from the weekly averages.

First method.—For the 93 stations having 40 or more years of records, the weekly means were subjected to a four-term Fourier analysis and 52 values of normal temperatures were computed therefrom. These, of course, were separated from each other by an exact interval of $7\frac{1}{52}$ days. By an appropriate and progressive adjustment these computed values were transformed to 52 values at intervals of exactly 7 days, except that the 52nd week, beginning June 26, was made to contain 8 days.

It is considered unnecessary to outline the arithmetical processes followed in computing these weekly values, but they are recognized as superior to the methods usually followed in drawing free-hand curves through the observed data. From these weekly normals intermediate daily values were easily interpolated for both the maximum and minimum separately. The mean of the two normal extremes is considered to give a normal daily mean temperature of great significance, and these are the values given in the accompanying tables.

Second method.—For stations with a length of record from 20 to 39 years the final daily values of the normal maximum and the normal minimum temperatures were obtained by drawing

smooth curves through the 52 weekly averages and scaling the daily values therefrom, similar to the manner of obtaining the data given in Bulletin R previously explained, save that the number of points available for plotting was increased from the 12 mean monthly values to 52 means for the respective weeks, the increase in the number of points affording opportunity to produce a curve upon which could be located with considerable accuracy the extreme points, and the proper rate of change in the varying portions of the month.

Much credit is due to Mr. William Mahaffy, Mr. H. C. Hunter, Miss M. O. Souder, and Miss Grace W. Carter of the Climatological Division for the intelligent and accurate handling of the various and difficult computations.

THE DAILY, MONTHLY, AND ANNUAL NORMALS OF PRECIPITATION FOR THE UNITED STATES, BASED ON THE 50-YEAR PERIOD, 1878 TO 1927, INCLUSIVE. ALSO SUMS OF THE DAILY VALUES BY 14-DAY PERIODS THROUGHOUT THE ENTIRE YEAR

The last general revision of the precipitation normals for the regular first-order stations of the bureau was made in 1907 and embraced data up to 1906, inclusive, so that more than 20 years have elapsed since that time.

Many new first-order stations have been established in that period for which normals are desired, and the addition of more than 20 years to the record already established affords desirable data for recomputing with better results the normals for the older stations of the bureau.

In this revision it seemed desirable to have the normals based uniformly upon a half century of record, and the period, January, 1878, to December, 1927, inclusive, was adopted; all stations having fewer years of record have been corrected to that period, either by interpolating the monthly amounts for the missing years directly from charts of monthly totals of precipitation for the missing years or by correcting the shorter periods to the full 50 years by the usual methods of comparison with the data from near-by stations.

Over the greater part of the country it was possible to safely interpolate the missing monthly amounts by scaling the values from charts of monthly precipitation based on reports from all stations in the immediate vicinity in operation during the respective months and years. On account of the large number of cooperative precipitation observations being made over most sections of the country, their values afforded ready means for interpolation where the topography favored a rather uniform distribution of precipitation over near-by areas. The broken topography with mountains and valleys over much of the western part of the country prohibited direct interpolation in that section from such charts, and here it was necessary to interpolate the missing records by establishing the normal ratios the short-record stations have to near-by long-record stations and applying the ratios to determine the probable data for the missing period of the short-record station using, where feasible, the records of a station on each side of the short-period station and combining the two sets of values.

As a result of these interpolations, a 50-year precipitation normal has been established for each first-order Weather Bureau station in operation at the end of 1927, thereby furnishing comparable data for a half century over all parts of the country.

In establishing the daily normals, all daily precipitation records for each station from 1878 to 1927 were tabulated and the averages determined for each day of the year for that period. Where the periods of observation were less than the 50 years selected, the monthly averages were first corrected to the full 50 years and the average daily values for the actual period of observations were corrected to make their monthly sums exactly equal the new 50-year monthly averages.

As a rule these monthly corrections were comparatively small, and they were distributed through the days of the month arbitrarily, but with a view to harmonizing extreme daily amounts, additive corrections were applied to the smaller daily values, while subtractive corrections were applied to the larger daily amounts.

These average daily values may be at times unduly distorted by occasional heavy rains on a particular date or dates, the effects of which would be naturally overcome only after the lapse of many additional years of record. To overcome the effect of these abnormalities on the corresponding daily values all the latter were smoothed for each station by the usual process of making successive 5-day means and using these values for the daily means throughout the year; thus the mean of the 5-day period, December 30 to January 3, would be used as the normal value for January 1; the mean of December 31 to January 4 would form the mean for January 2, and so on throughout the year, care being taken to see that the final sum of these smoothed daily values exactly equaled the 50-year monthly and annual means.

These normals were put in operation at the greater part of the first-order stations beginning January 1, 1928, but the results of some of the shorter-record stations were not prepared in time for such action, and these began with January 1, 1929.

The total number of these stations is 197. Those having a complete record for the entire period of 50 years is 96; those having from 40 to 49 years of complete record is 54; those 30 to 39 years of complete record is 25; those with 20 to 29 years of complete record is 14; and those with less than 20 years of complete record is 8.

In order to facilitate theoretical studies of the annual march and distribution of precipitation at the various stations, there have been compiled the consecutive 14-day sums of the actual, unsmoothed precipitation, from the beginning of January to the last fortnight of the year, which naturally embraces 15 days. It is believed these data are decidedly superior to the ordinary amounts of precipitation for the unequal calendar months which, moreover, are deemed to be too long a period of time in which to bring out certain important characteristics.

Much assistance in the preparation of these normals has been given the the officials in charge of the Weather Bureau stations at Ludington, Mich., and Portland, Me., and by Miss Grace W. Carter and Miss Mary O. Souder of the Climatological Division.

The third normals used in the Weather Bureau cover the period 1921-1950. Monthly values for 368 locations were issued in 1954 in a publication called "Monthly Normal Temperatures Precipitation and Degree Days" sale price 10 cents, and were re-issued in 1956 as Technical Paper No. 31 with the same title. Technical Paper No. 31, price 25 cents, contains data for 388 locations. The following Preface is taken from it.

PREFACE

These normals are based on records for the thirty-year period 1921 to 1950, inclusive.

Where a station had a record for the entire 30 years from the same instrument site, monthly precipitation normals are the mean of the monthly values for the 30 years. For such stations, the temperature normals were obtained in a similar manner, using normal maximum and normal minimum values to obtain monthly normals. The annual normal temperature is obtained by dividing the sum of the annual normal maximum value and the annual normal minimum value for temperature by two.

For stations that did not have continuous records from the same instrument site for the entire 30 years, 1921-1950, the means have been adjusted to the record at the present site. In these adjustments, a "difference factor" was used for temperature and a "ratio factor" for precipitation. These factors were determined by parallel comparison, either between records at the actual station sites or through a second station that had a continuous record to compare against both sites for obtaining the resultant adjusting factors. Normals were thereafter obtained as outlined above.

The degree day normals shown herein are derived from the values for the monthly normal maximum and minimum temperature, and are computed on the standard base of 65°F. The seasonal total is equivalent to the annual total. Monthly normals of less than 5 degree days are shown as zero.

This system of normals departs from those previously used in three respects: (a) The 30-year period (1921-1950) adopted for the computations is consistent with the term of years accepted by the World Meteorological Organization for climatic normals. (b) Painstaking effort has been made to secure values that avoid artificial smoothing of the curves of monthly and seasonal march of the data; where the station and exposure for records in a given locality have been changed, the whole record has been carefully studied and adjusted to the latest source of records and reports. (c) For the first time, the normals for maximum and minimum temperatures are separately tabulated and made available.

Daily temperature normals were obtained by plotting monthly values on graphs at the midpoints, fitting curves, and reading the daily values from the curves. The annual temperature normal was obtained by dividing the sum of the annual normal maximum and annual normal minimum temperatures by two. Daily values were published on separate sheets entitled "Daily Temperature and Precipitation Normals," and revised in 1953 to include degree days. The title of the separate was then made "Daily Temperature, Degree Day and Precipitation Normals".

SNOW COVER SURVEY

This publication, issued on an annual basis beginning with data for the winter season of 1940-41 contains snow depth and water equivalent data for some 600 locations in the northeastern United States arranged by river basins. Data for the winter of 1941-42 and 1942-43 were published as one issue. The data are collected by various agencies (governmental and non-governmental) cooperating in the survey and are submitted to the Records Committee of the Eastern Snow Conference.

It was first issued in mimeographed form, size 8 1/2" x 14". Beginning with the 1948 - 1949 issue, printing was done by offset methods, with the size changed to 8 1/2" x 11".

A sales price has not been established on this publication.

TECHNICAL PAPERS

These papers, issued at irregular intervals, contain compilations of meteorological and climatological data for various elements, as indicated below by the titles. Similar studies were issued earlier as Supplements to the Monthly Weather Review.

WEATHER BUREAU TECHNICAL PAPERS

No. 1. Ten-year normals of pressure tendencies and hourly station pressures for the United States. Washington, D. C. 1943 $1.50
Supplement: Normal 3-hourly pressure changes for the United States at the intermediate synoptic hours. Washington, D. C. 1945 Out of Print.

No. 2. Maximum recorded United States point rainfall for 5 minutes to 24 hours at 207 first order stations. Washington, D. C. 1947. .25

No. 3. Extreme temperatures in the upper air. Washington, D. C. 1947. .75

No. 4. Topographically adjusted normal isohyetal maps for western Colorado. Washington, D. C. 1947 .75

No. 5. Highest persisting dewpoints in western United States. Washington, D. C. 1948. .35

No. 6. Upper air average values of temperature, pressure, and relative humidity over the United States and Alaska. Washington, D. C. 1945. .50

No. 7. A report on thunderstorm conditions affecting flight operations. Washington, D. C. 1948. .40

No. 8. The climatic handbook for Washington, D. C. Washington, D. C. 1949. $1.00

No. 9. Temperatures at selected stations in the United States, Alaska, Hawaii, and Puerto Rico, Washington, D. C. 1949. .15

No. 10. Mean precipitable water in the United States. Washington, D. C. 1949. .30

No. 11. Weekly mean values of daily total solar and sky radiation. Washington, D. C. 1949. .15. Supplement No. 1, 1955. .05.

No. 12. Sunshine and cloudiness at selected stations in the United States, Alaska, Hawaii, and Puerto Rico. Washington, D. C. 1951. .15

No. 13. Mean monthly and annual evaporation data from free water surface for the United States, Alaska, Hawaii, and the West Indies. Washington, D. C. 1950. .15

No. 14. Tables of precipitable water and other factors for a saturated pseudo-adiabatic atmosphere. Washington, D. C. 1951. .20

No. 15. Maximum station precipitation for 1, 2, 3, 6, 12, and 24 hours: Part I: Utah, Part II: Idaho. 1951, each .25; Part III: Florida. 1952, .45; Part IV: Maryland, Delaware, and District of Columbia, Part V: New Jersey. 1953, each .25; Part VI: New England. 1953, .60; Part VII: South Carolina. 1953, .25; Part VIII: Virginia. 1954, .50; Part IX: Georgia. 1954, .40; Part X: New York. 1954, .60; Part XI: North Carolina. 1955, .55; Part XII: Oregon. 1955, .55; Part XIII: Kentucky. 1955, .45; Part XIV: Louisiana, .35; Part XV: Alabama. 1955, .35; Part XVI: Pennsylvania. 1956, .65; Part XVII: Mississippi. 1956, .40; Part XVIII: West Virginia. 1956, .35; Part XIX: Tennessee. 1956, .45; Part XX: Indiana. 1956, .55; Part XXI: Illinois. 1958, .50; Part XXII: Ohio. 1958, .65.

No. 16. Maximum 24-hour precipitation in the United States. Washington, D. C. 1952. $1.25

No. 17. Kansas-Missouri floods of June-July 1951. Kansas City, Mo. 1952. .60

No. 18. Measurements of diffuse solar radiation at Blue Hill Observatory. Washington, D. C. 1952. .20

No. 19. Mean number of thunderstorm days in the United States. Washington, D. C. 1952. .15

No. 20. Tornado occurrences in the United States. Washington, D. C. 1952. .35

No. 21. Normal weather charts for the Northern Hemisphere. Washington, D. C. 1952. $1.75

No. 22. Wind patterns over lower Lake Mead. Washington, D. C. 1953. .25

No. 23. Floods of April 1952-Upper Mississippi, Mississippi, Missouri, Red River of the North. Washington, D.C. 1954. 1.00

No. 24. Rainfall intensities for local drainage design in the United States. For durations of 3 to 240 minutes and 2-, 5-, and 10-year return periods. Part I: West of 115th meridian. Washington, D. C. 1953, .20; Part II: Between 105°W. and 115°W. Washington, D. C. 1954. .15

No. 25. Rainfall Intensity-Duration-Frequency Curves. For selected stations in the United States, Alaska, Hawaiian Islands, and Puerto Rico. Washington, D. C. 1955. .40

No. 26. Hurricane Rains and Floods of August 1955. Carolinas to New England. Washington, D. C. 1956. (Part III replaces a preliminary issuance of rainfall data entitled "Hurricane Rains and Floods of August 1955.) 1.00

No. 27. The Climate of the Matanuska Valley. Washington, D. C. 1956. .25

No. 28. Rainfall intensities for local drainage design in western United States. For durations of 20 minutes to 24 hours and 1- to 100-year return periods. Washington, D. C. 1956. .70

No. 29. Rainfall Intensity-Frequency Regime. Part 1-The Ohio Valley. Washington, D. C. 1957, .30; Part 2-Southeastern United States. 1958. 1.25

No. 30. Tornado deaths in the United States. Washington, D. C. 1957. .50

No. 31. Monthly normal temperatures, precipitation, and degree days. Washington, D. C. 1956. .25

No. 32. Upper-Air Climatology of the United States, Part 1-Averages for Isobaric Surfaces, Height, Temperature, Humidity and Density. Washington, D. C. 1957. 1.25

No. 33. Rainfall and floods of April-May-June 1957 in the south-central States. Washington, D. C. 1958. 1.75

NOTE: In addition to the Technical Paper series there are three others, Research Papers, Cooperative Studies Reports and Hydrometeorological Reports. Most of these papers do not contain climatological data as such, and therefore are not listed individually in this history.

U. S. Meteorological Yearbook
(and its predecessors, Annual Report of the Chief, U. S. Weather Bureau, and Annual Report of the Chief Signal Officer)

The first report of the Chief Signal Officer containing annual climatological data was for 1872.

Data continued to be included annually in the report of the Chief Signal Officer until 1891. Values for 1891 and 1892 were combined into one volume and issued as part of the first report of the Chief of the Weather Bureau. Publication of data on an annual basis in this report continued through 1934.

Annual data for 1935 through 1942 were issued yearly as the "United States Meteorological Yearbook." The final issue of the Yearbook covers the period 1943-1949. Annual data for 1950 and succeeding years are carried in the annual issue of Climatological Data, National Summary.

Weekly Weather and Crop Bulletin, National Summary

The history of this publication, prepared by the present editor, John L. Baldwin was

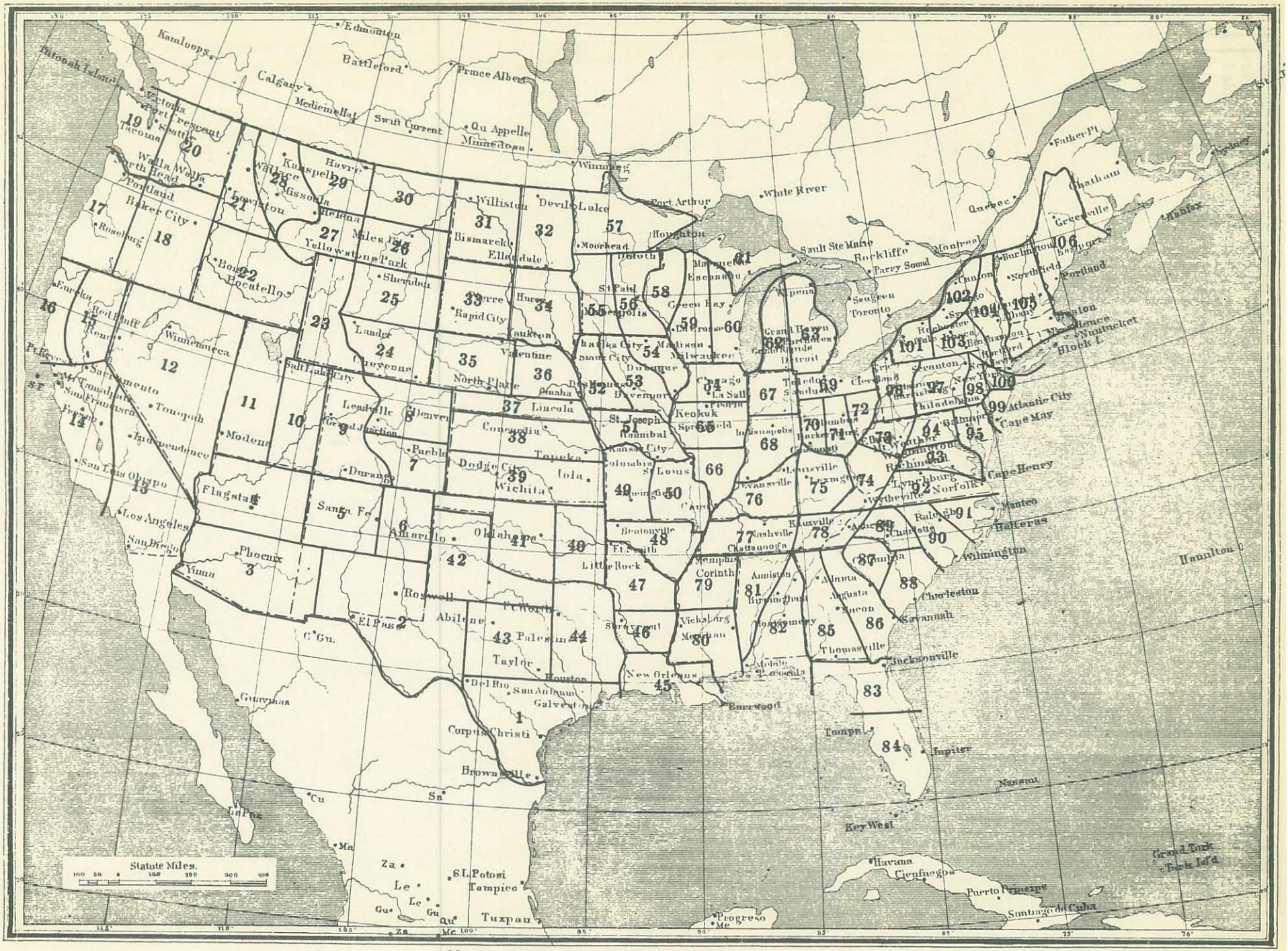
carried in tabular form in the June 13, 1955 issue of the Bulletin. It is reproduced here. No significant changes have taken place in this bulletin since this summary was prepared.

83 YEARS OF THE WEEKLY WEATHER AND CROP BULLETIN

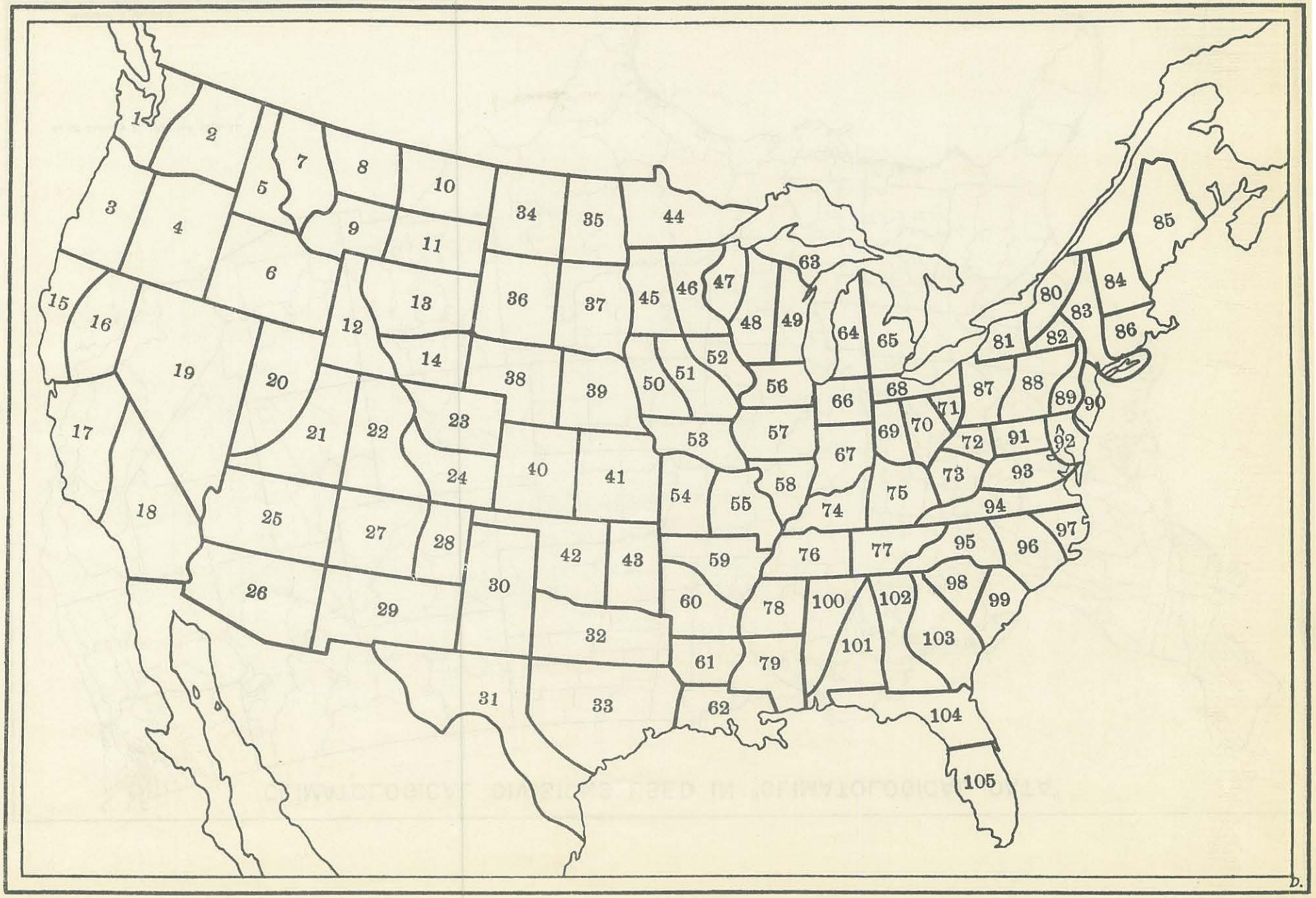
Title	Period	Bureau or Office	Department	Remarks
Weekly Weather Chronicle	Nov. 16, 1872-Apr. 4, 1881	Signal Corps	War	This was a 2-page printed release that contained a general summary of weather for each week ending on Wednesday. A paragraph on rivers was included, beginning in 1873. Publication discontinued in 1881.
Special Bulletin	June 1884-Apr. 1887	"	"	Issued as a special bulletin for the month; a one-page leaflet.
Weather Crop Bulletin	May 1887-June 26, 1891	"	"	Issued weekly during growing season May to September and monthly during other months. Consisted of one page of text under headings of "Temperature," "Precipitation," and "General Remarks." Crop information was given.
Weather Crop Bulletin	July 1891-Jan. 1896	Weather Bureau	Agriculture	The Weather Service of the Signal Corps was transferred from the War Department to the Department of Agriculture, effective July 1, 1891, thus creating the Weather Bureau. The Bulletin was issued weekly from April through September and monthly Octoberto March. One large page (19"x24") containing charts of temperature and precipitation, tabulations of temperature and precipitation, and text under headings "Temperature," "Precipitation," "General Summary," and "State Summaries." The general plan (format) of the publication continued with little change to the end of 1921, except for adding the Snow and Ice Bulletin at end of 1919 as mentioned below.
Climate and Crop Bulletin	Feb. 1896-Aug. 22, 1904	"	"	Title of publication changed.
Weather Crop Bulletin	Aug. 29, 1904-Jan. 1906	"	"	Title of publication changed.
National Weather Bulletin	Feb. 1906-June 1914	"	"	Title of publication changed.
National Weather and Crop Bulletin	July 6, 1914-Dec. 1921	"	"	Title of publication changed. The Snow and Ice Bulletin that had been issued as a separate publication since 1894 was combined with the National Weather and Crop Bulletin during the winter from December 1919 to December 1921.
Weather, Crops, and Markets	Jan. 1922-Dec. 1923	"	"	For economy the bulletin was reduced in content and consolidated with the Crops and Markets under the title Weather, Crops, and Markets and published weekly at the Government Printing Office. The tabulation of temperature and precipitation was dropped, but the charts of temperature and precipitation, discussion of weather and its effects on crops, and State telegraphic summaries were generally carried in the consolidated publication.
Weekly Weather and Crop Bulletin	Jan. 1924-June 1940	"	"	Due to public demand for more detailed and earlier release of information on the weather and its effects on crops, a separate publication was again issued and printed weekly at the Weather Bureau. This bulletin consisted of 4 pages (9 1/2"x12") and contained a general discussion of conditions during the week with special emphasis on small grains, corn, cotton, miscellaneous crops, and pastures; charts and tabulation of temperature and precipitation; and State telegraphic summaries. The Snow and Ice Bulletin that was resumed as a separate publication from January 1922 to November 1932 was again added to the Weekly Weather and Crop Bulletin for the December to March period from December 1932 to the present.
Weekly Weather and Crop Bulletin	July 1940-(continuing)	"	Commerce	The Weather Bureau was transferred from the Department of Agriculture to the Department of Commerce, effective July 1, 1940. There was little change in the format of the bulletin until October 18, 1954, when revised into the present 8-page publication.

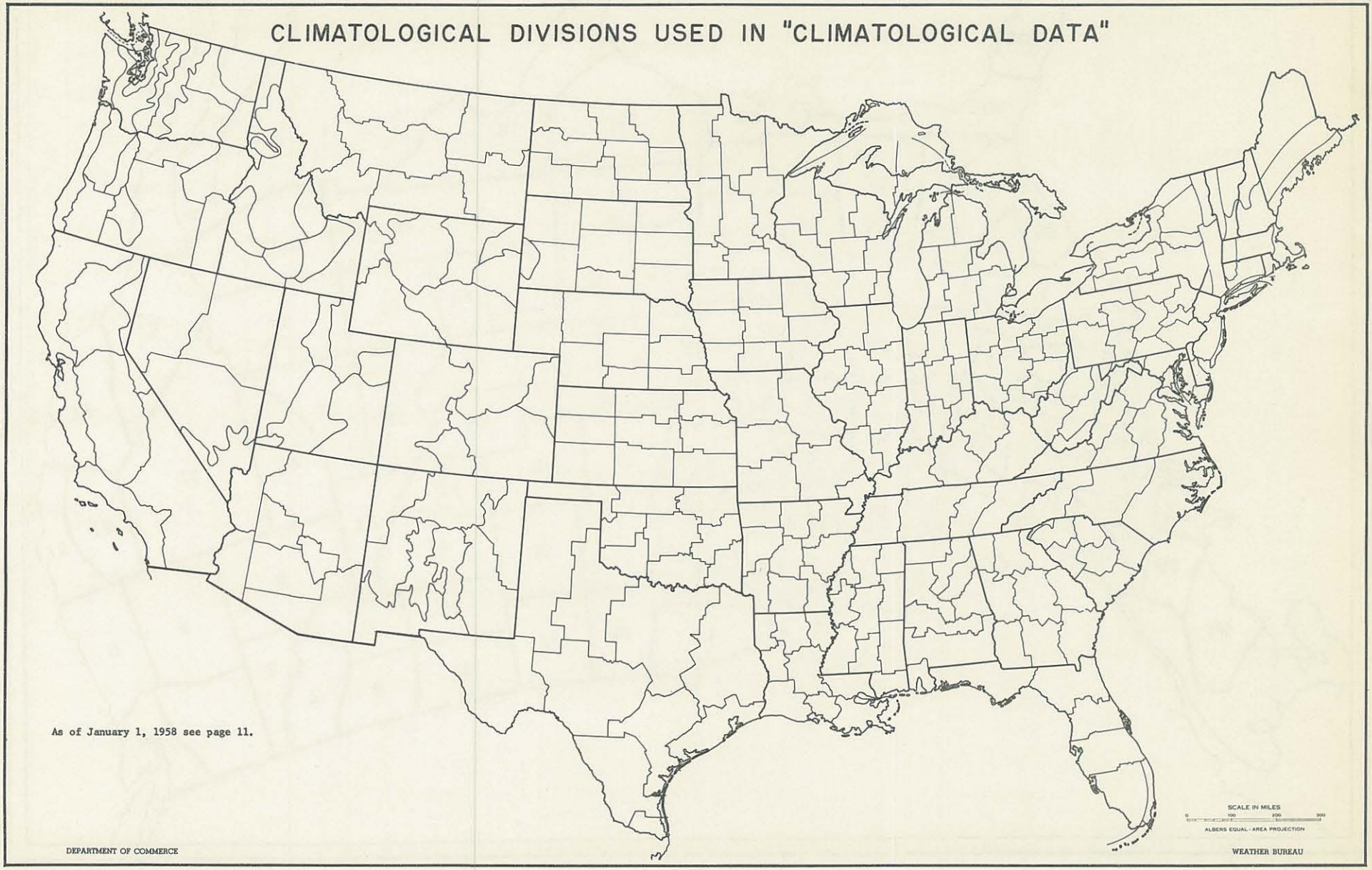
In addition local Weekly Weather and Crop Bulletins have been issued in most states by the Weather Bureau and the U. S. Dept. of Agriculture (Bureau of Agricultural Economics and later Agricultural Marketing Service) for several years. These joint bulletins are not included in this description since most of them are issued by the U. S. Department of Agriculture.

106 CLIMATOLOGICAL SECTIONS IN THE UNITED STATES
(Used in the first and second editions of Bulletin W)



Climatological Sections in the United States
(1930 Edition)





☆U. S. GOVERNMENT PRINTING OFFICE : 1959 O - 491468